CLAIMS

1. A charged particle spectrometer which is operable in a first mode to produce an energy spectrum relating to the composition of a sample being analysed, and in a second mode to produce a charged particle image of the surface of the sample being analysed, wherein the spectrometer includes a detector which is used to detect charged particles produced in both modes of operation.

2. A charged particle spectrometer according to claim 1 which is a photoelectron spectrometer, wherein the charged particle image is a photoelectron image, and wherein the charged particles are photoelectrons.

3. A charged particle spectrometer according to claim 1 or claim 2 wherein the detector includes a plate means, on to which, in use, primary electrons are directed in both modes of operation, and which emits a plurality of secondary electrons for each primary electron received.

4. A charged particle spectrometer according to claim 3 wherein the plate means is a micro channel plate.

5. A charged particle spectrometer according to claim 3 or claim 4 wherein the detector also includes a first delay line means for using the plurality of secondary electrons to produce a pair of electrical pulses in a first delay line from which a signal processing means can calculate the location of the primary electron on the plate means in a first direction.

6. A charged particle spectrometer according to claim 5 wherein the detector also includes a second delay line means for using the plurality of secondary electrons to produce a pair of electrical pulses in a second delay line from which the signal processing means can calculate the location of the primary electron on the plate means in a second direction.

7. A charged particle spectrometer according to claim 6 wherein the first and second directions are orthogonal.

8. A charged particle spectrometer according to any one of claims 5 to 7 wherein second signal processing means processes the signals received from one or both of the delay lines to reduce or eliminate any unwanted signals.

9. A charged particle spectrometer according to any one of claims 5 to 8 including a control means for controlling its operation and enabling a user to select which of the two modes is operating.

10. A charged particle spectrometer according to claim 9 wherein the control means also controls the signal processing means such that when the spectrometer is operating in said first mode, the signal processing means utilises signals from only one of the delay line means.

11. A charged particle spectrometer according to claim 9 or claim 10 wherein the control means also controls the signal processing means so that when the spectrometer is operating in said second mode the signal processing means utilises signals from both the first and second delay line means.

12. A charged particle spectrometer according to any one of claims 9 to 11 wherein the control means includes further processing means for increasing the accuracy of time measurements of the electrical pulses.

13. A charged particle spectrometer according to claim 12 wherein the further processing means increases said accuracy by stretching the time between each one of a pair of pulses so that the time difference may be more accurately measured.

14. A detector for a charged particle spectrometer, which spectrometer is operable in a first mode to produce an energy spectrum relating to the composition of a sample being analysed, and in a second mode to produce a charged particle image of the surface of the sample being analysed, wherein the detector is usable to detect charged particles produced in both modes of operation.

15. A detector according to claim 14 wherein the charged particle spectrometer is a photoelectron spectrometer, the charged particle image is a photoelectron image, and the charged particles produced in both modes of operation are photoelectrons.

16. A detector according to claim 14 or claim 15 including a plate means, on to which, in use, primary electrons are directed in both modes of operation, and which emits a plurality of secondary electrons for each primary electron received.

17. A detector according to claim 16 wherein the plate means is a micro channel plate.

18. A detector according to claim 16 or claim 17 also including a first delay line means for using the plurality of secondary electrons to produce a pair of electrical pulses in a first delay line from which a signal processing means can calculate the location of the primary electron on the plate means in a first direction.

19. A detector according to claim 18 also including a second delay line means for using the plurality of secondary electrons to produce a pair of electrical pulses in a second delay line from which the signal processing means can calculate the location of the primary electron on the plate means in a second direction.

20. A detector according to claim 19 wherein the first and second directions are orthogonal.

21. A detector according to any one of claims 18 to 20 wherein the signal processing means processes the signals

received from one or both of the delay lines to reduce or eliminate any unwanted signals.

22. A detector according to any one of claims 19 to 21 wherein the signal processing means utilises signals from only one of the delay line means when the spectrometer is operating in said first mode.

23. A detector according to claim 22 wherein the signal processing means utilises signals from both the first and second delay line means when the spectrometer is operating in said second mode.

24. A detector according to any one of claims 18 to 23 wherein further processing means increase the accuracy of time measurements of the electrical pulses.

25. A detector according to claim 24 wherein the further processing means increases said accuracy by stretching the time between each one of a pair of pulses so that the time difference may be more accurately measured.

26. A method of operation of a charged particle spectrometer according to any one of claims 1 to 13 wherein the method includes the step of selecting which

of said first and second modes to use and the detector being operated accordingly.